CLAIMS

1. A method in a digital image processing chain (10) for adjusting a colour balance, in which method

- the subject is imaged by pixels to form value-sets of the colour components (R, G, B),
- component-specific histograms are formed from the value-sets of the colour components (R, G, B),
- cumulative histograms are formed from the component-specific histograms,
- the illumination colour (R_{ill}, G_{ill}, B_{ill}) corresponding to at least one colour component is defined from the cumulative histograms,
- using target colour (R_{tgt}, G_{tgt}, B_{tgt}) and defined illumination colour (R_{ill}, G_{ill}, B_{ill}) are defined for at least two colour components (R, G, B) a gain factor (G_R, G_G, G_B) adjusting the colour balance,

characterized that, in the method

- a such point h_i, at which the colour-componentwise pixel-intensity values C_i, C_{i+1}, corresponding to the consecutive points h_i, h_{i+1}, meet the criteria conditions set for them in the case of at least one colour component (R, G, B), is defined from the essentially flat area of the colour curve at the ends of the cumulative histograms, and
- a colour-componentwise intensity value C_i, corresponding to the common defined point h_i is set for at least one colour component (R, G, B), to correspond to the illumination colour (R_{ill}, G_{ill}, B_{ill}).

2. A method according to Claim 1, characterized in that the illumination colour (R_{ill}, G_{ill}, B_{ill}) is defined from the cumu-

lative histograms, by searching for the smallest index i meeting the following sub-criteria:

1) the ratio r_C of the pixel values C_i, C_{i+1}, corresponding to two consecutive points h_i, h_{i+1} selected according a set interval division, is less than a first threshold value t_1 set for them, in each colour component (R, G, B), i.e.

$$r_C = \frac{C_i}{C_{i+1}} < t_1, C = (R,G,B),$$

2) such caused sum of the ratios r_c corresponding to the pixel values C_i, C_{i+1} is less than a second threshold value t_2 set for them,

$$\frac{R_i}{R_{i+1}} + \frac{G_i}{G_{i+1}} + \frac{B_i}{B_{i+1}} < t_2, \text{ and}$$

3) the ratio of the relative speeds of change of the pixel values C_i, C_{i+1} between the maximum pixel-value change and the minimum pixel-value change is less than a third threshold value t_3 set for it,

$$\frac{\max\left(((C_i - C_{i+1}) / C_{i+1}),\ \ in\ which\ C \in R \| G \| B\right)}{\min\left(((C_i - C_{i+1}) / (C_{i+1}),\ \ in\ which\ C \in R \| G \| B\right)} < t_3, \text{ and}$$

in which the intensity values C_i of each colour component corresponding to the point h_i, meeting the conditions 1 - 3, are set to correspond to the illumination colour (R_{ill}, G_{ill}, B_{ill}).

3. A method corresponding to Claim 2, characterized in that the first threshold value t_1 varies within the range 1,0 - 1,5, preferably within the range 1,01 - 1,2.

4. A method according to Claim 2 or 3, characterized in that the second threshold value t_2 varies within the range 3,0 - 4,0, preferably within the range 3,0 - 3,5.

5. A method according to any of Claims 2 - 4, characterized in that the third threshold value t_3 varies within the range 3,0 - 5,0, being preferably about 4,0.

6. A method according to any of Claims 1 - 5, characterized in that, in the method, pedestal elimination (PE) is also performed on the pixel values of the raw matrix, prior to the colour-balance adjustment (CBC).

7. A method according to Claim 6, characterized in that the pedestal elimination (PE) is performed at least partly linearly, for example, in such a way that

- when the pixel-value level of a colour component (R, G, B) is below a threshold value (t) set for it, an offset (p) is deducted by direct subtraction, and, after the set threshold value (t),
- the offset (p) is deducted, however, at the same time gaining the pixel-values in such a way that the maximum pixel-value level does not substantially diminish.

8. A method according to any of Claims 1 - 7, characterized in that, in the method, a vignetting elimination procedure (VE) is also performed, preferably after the pedestal elimination (PE) and before the colour-balance adjustment (CBC).

9. A method according to Claim 8, characterized in that a spatially varying offset and a pixel-value gain factor (vf) are used in the vignetting elimination procedure (VE).

10. A method according to Claim 9, characterized in that the gain factor (vf) is developed separately for each colour component (R, G, B).

11. A method according to any of Claims 1 - 10, characterized in that, in connection with the method, a dark-colour correction procedure is also performed, in which, as sub-stages,

- such pixel values meeting a threshold condition (dpcc) set for them are sought from the cumulative histogram,
- the defined darkest colour component is stretched using an offset of a defined magnitude towards the dark end of the histogram, while also processing the other colour components in the same proportion, and
- readjustment is performed on the gains (G_R, G_G, G_B) of the conversion functions.

12. A method according to any of Claims 1 - 11, characterized in that a median pixel value is defined for each colour component (R, G, B) and, if the median pixel value of the selected reference component and the median pixel value of the colour component (R, G, B) differ from each other in a set manner, the gains (G_R, G_G, G_B) are adjusted, in order to reduce the difference.

13. A method according to any of Claims 1 - 12, characterized in that the method also includes a gamma-correction stage GC, in which

- a shot type, which can be, for example, normal, backlight, or low-contrast, is defined from the cumulative histograms,
- on the basis of the shot-type definition, the gamma value selected for use in the gamma correction is reduced, in proportion to how much the im-

age should be brightened, which gamma value can vary, for example, in the range 0,10 - 0,80, preferably in the range 0,20 - 0,60.

14. A method according to any of Claims 1 - 13, characterized in that, prior to the formation of the cumulative histograms, at least such pixel values ($G_{(s)}$), in which the pixel value of the same image point (15.1) in even one value set meets a selected criterion, are filtered out of at least one value set.

15. A system in a digital image processing chain (10) for adjusting a colour balance, which system includes

- means for imaging a subject by pixels to form value-sets of the colour components (R, G, B),
- means for forming componentwise histograms from the value-sets of the colour components (R, G, B),
- means for forming cumulative histograms from the componentwise histograms,
- means for defining the illumination colour (R_{ill}, G_{ill}, B_{ill}) corresponding to at least one colour component from the cumulative histograms,
- means for defining a gain factor (G_R, G_G, G_B) for at least two colour components (R, G, B) adjusting the colour balance using target colour (R_{tgt}, G_{tgt}, B_{tgt}) and defined illumination colour (R_{ill}, G_{ill}, B_{ill}),

characterized in that, the system also includes

- means for defining, from the essentially flat area of the colour curve at the end of cumulative histograms, such a point h_i, in which the colour-componentwise pixel-intensity values C_i, C_{i+1}, corresponding to the consecutive points h_i, h_{i+1}, are arranged to meet the criteria conditions set for them in the case of at least one colour component (R, G, B), and

- means for setting the color-componentwise intensity value C_i, corresponding to the defined common point h_i, for at least one color component (R, G, B) to correspond to the illumination colour (R_{iii}, G_{iii}, B_{iii}).

16. A system according to Claim 15, characterized in that the system also includes a functionality, arranged before the colour-balance adjustment (CBC), for performing pedestal elimination (PE) on the pixel values of the raw matrix.

17. A system according to Claim 15 or 16, characterized in that the system also includes means for performing vignetting elimination (VE), which are preferably arranged after the pedestal elimination (PE) and before the colour-balance adjustment (CBC).

18. A system according to any of Claims 15 - 17, characterized in that the system also includes means for correcting a dark colour.

19. A system according to any of Claims 15 - 18, characterized in the system also includes means for filtering out prior to the formation of the cumulative histograms at least such pixel values ($G_{(s)}$) of at least one value set, in which the pixel value of the same image point (15.1) in even one value set meets a selected criterion.

20. An equipment for adjusting colour balance, in which the equipment includes a digital image-processing chain (10), in which the chain (10) includes

- means for imaging a subject by pixels to form value-sets [R], [G], [B] of the colour components (R, G, B),

- means for forming componentwise histograms from the value-sets of the colour components (R, G, B),
- means for forming cumulative histograms from the componentwise histograms,
- means for defining the illumination colour (R_{ill}, G_{ill}, B_{ill}) corresponding to at least one colour component from the cumulative histograms,
- means for defining a gain factor (G_R, G_G, G_B) for at least two colour components (R, G, B) adjusting the colour balance using target colour (R_{tgt}, G_{tgt}, B_{tgt}) and defined illumination colour (R_{ill}, G_{ill}, B_{ill}),

characterized in that the equipment also includes

- means for defining, from the essentially flat area of the colour curve at the end of cumulative histograms, such a point h_i, in which the colour-componentwise pixel-intensity values C_i, C_{i+1}, corresponding to the consecutive points h_i, h_{i+1}, are arranged to meet the criteria conditions set for them in the case of at least one colour component (R, G, B), and
- means for setting the color-componentwise intensity value C_i, corresponding to the defined common point h_i, for at least one color component (R, G, B) to correspond to the illumination colour (R_{ill}, G_{ill}, B_{ill}).

21. Software means for implementing the method according to Claim 1, in which the means include an interface for receiving image data

- software means for imaging a subject by pixels to form value-sets of the colour components (R, G, B),

- software means for forming componentwise histograms from the value-sets [R], [G], [B] of the colour components (R, G, B),
- software means for forming cumulative histograms from the componentwise histograms,
- software means for defining the illumination colour (R_{ill}, G_{ill}, B_{ill}) corresponding to at least one colour component from the cumulative histograms,
- software means for defining a gain factor (G_R, G_G, G_B) for at least two colour components (R, G, B) adjusting the colour balance using target colour (R_{tgt}, G_{tgt}, B_{tgt}) and defined illumination colour (R_{ill}, G_{ill}, B_{ill}),

characterized in that, in the software means, there are also arranged

- software means for defining, from the essentially flat area of the colour curve at the end of cumulative histograms, such a point h_i, in which the colour-componentwise pixel-intensity values C_i, C_{i+1}, corresponding to the consecutive points h_i, h_{i+1}, are arranged to meet the criteria conditions set for them in the case of at least one colour component (R, G, B), and
- software means for setting the color-componentwise intensity value C_i, corresponding to the defined common point h_i, for at least one color component (R, G, B) to correspond to the illumination colour (R_{ill}, G_{ill}, B_{ill}).